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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
MILLER, PATRICK L	

ART UNIT	PAPER NUMBER
2837	

DATE MAILED: 08/24/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/065,688	SCHUCHMANN, RUSSELL P.	
	Examiner	Art Unit	
	Patrick Miller	2837	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *19 May 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,4-16 and 18-20* is/are rejected.

7)☒ Claim(s) *3 and 17* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *08 November 2002* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments, see amendment, filed on May 19, 2004, with respect to the rejection(s)of claim(s) s 1, 8, 14, and 19 under 35 USC 103 have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Higgins et al (3,839,628).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1, 2, 4-7, 14-16, 19, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Higgins et al (3,839,628).

   - With respect to claim 1, Higgins et al disclose a motor controller that controls a motor system, the controller having at least one voltage sensor (Fig. 1, #18) and at least one current sensor (Fig. 1, #26) and configured to: receive a voltage and a current signal of the motor system in operation from the voltage and current sensors, respectively (Fig. 1, inputs to #22); determine a power signal from the voltage signal and the current signal (Fig. 1, #22 multiplies voltage and current to get a power signal); generate a real-time spectrum analysis of the power signal (Fig. 4; col. 5, lines 49-62); and determine undesirable torque conditions in the system from the spectrum analysis (col. 5, lines 52-62; cols. 2/3, lines 33-68/1-3).

- With respect to claim 14, Higgins et al disclose a method of detecting mechanical anomalies in an operating of a motor system, the method comprising the steps of: capturing an operational model of the motor system known to be operating normally (col. 4, lines 10-38; Register A stores the model); generating a baseline power signal from the modeling (col. 4, lines 10-61); acquiring instantaneous voltage and current signal of the motor assembly from the voltage and current sensors (col. 3, lines 48-65); determining a real-time power signal from the voltage and current signals (cols. ¾, lines 48-68/1-9); and determining undesirable harmonics in the real-time power signal based on a comparison with the baseline power signal (col. 5, lines 38-62).
- With respect to claims 1 and 14, Higgins et al do not disclose the motor controller controlling a motor-driven pump, but does disclose that the motor controller can operate *any* machine or process that is operated by an electric motor (col. 3, lines 39-48). Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention that because Higgins et al disclose that their motor controller can be used with any system operated by an electric motor, the Higgins et al system could be used with a motor-driven pump. This would provide the advantage of using a measured power signal to monitor the power delivered to the motor of the motor-driven pump and indicate when operating parameters are outside of specific limits due to undesirable torque conditions.
- With respect to claim 2, Higgins et al disclose the controller being configured to automatically provide an external indication of the undesirable torque condition in the pump (col. 5, lines 52-61; Fig. 4, output on computer screens).

- With respect to claims 4 and 16, Higgins et al disclose conditioning the instantaneous voltage and current signals (Fig. 1, #22 conditions signals); digitizing the conditioned signals (Fig. 1, #28); converting the time domain power signal to frequency domain (col. 5, lines 38-62); and outputting a frequency domain signal to a digital-to-analog (D/A) converter and displaying the analog signal (Fig. 1, to #'s 36 and 38, and displayed on #42). Higgins et al do not explicitly disclose applying a FFT to transform the power signal from time domain to frequency domain. However, the Examiner takes Official Notice that it would have been obvious to one having ordinary skill in the art at the time of the invention that a FFT could be used to transform the power signal of Higgins et al from the time domain to the frequency domain. The motivation to apply a FFT to transform the power signal is to provide the advantage of reducing the number of computations, which decreases computation time, when compared to regular Fourier transformation algorithms.
- With respect to claim 5, Higgins et al disclose the controller configured to band-pass filter the power signal (col. 5, lines 62-68; Fig. 5, #'s 72 and 74).
- With respect to claim 6, the controller generates a model spectrum analysis during normal operation and determines undesirable torque conditions by comparing the model to the real-time spectrum analysis (col. 4, lines 39-68; model is stored in register A and compared to the spectrum value in register B).
- With respect to claim 7, the undesirable torque condition is a mechanical interference with the system (cols. 2/3, lines 32-68/1-3).

- With respect to claim 15, Higgins et al disclose determining an undesirable mechanical condition based on a presence of undesirable harmonics in the real-time power signal (cols. 5/6, lines 38-68/1-30; undesirable harmonics are when the difference between the magnitude of the measured power and the model power is greater than a threshold value).
- With respect to claim 19, Higgins et al disclose an apparatus for detecting undesirable torsional/mechanical conditions in a motor system, the apparatus comprising: a voltage sensor (Fig. 1, #18) and a current sensor (Fig. 1, #26); a processor configured to receive data from at least one of the voltage sensor and current sensor (Fig. 1, #'s 22, 28, and registers process data); the processor having a means for determining a power signal from the voltage and current data (Fig. 1, #22 determines power by multiplying voltage and current); a means for generating a spectrum analysis of the power signal (Fig. 4; col. 5, lines 48-62); a means for comparing the spectrum analysis to a spectrum analysis modeled power signal (col. 5, lines 59-62); and a means for determining undesirable harmonics indicative of mechanical disturbances in the pump from the comparison (col. 6, lines 7-30).
- With respect to claim 20, Higgins et al disclose a means for displaying the spectrum analysis of the power signal on a console (col. 5, lines 31-62; displayed on a monitor; Fig. 4).

3. Claims 8-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Higgins et al (3,839,629) in view of Kliman (6,199,023).
   - Higgins et al disclose a medium to detect and signal mechanical anomalies in a motor-driven system, where the medium determines an instantaneous motor power signal from

voltage and current data collected by one or more voltage and current sensors (Fig. 1, #22 calculates power from #18 and #26); processing the instantaneous motor power signal (Fig. 1, #28 and Registers process the power signal); comparing the processed instantaneous power signal to a power signal modeled during healthy operation of the motor (cols. 5/6, lines 38-68/1-30); and if the processed instantaneous motor power signal exceeds a threshold, providing an external notification signaling anomalies in the motor-driven system (col. 6, lines 7-30).

- Higgins et al do not disclose the control system being controlled by a computer that uses a computer program stored on a computer readable storage medium.
- Kliman disclose a control system to detect and signal mechanical anomalies in a motor-driven system, wherein the control system is implemented using a computer that uses a program (Fig. 5, #37). Furthermore, the computer program instructs the computer to measure current and voltage and transform the measured voltage from the time domain to the frequency domain using a Fast Fourier Transform (FFT) (col. 4, lines 51-62). Using a computer program to control a motor system provides the advantage of decreasing system computation time, especially when performing FFT's, since a computer may be configured with enough memory to efficiently handle FFT calculations.
- Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention that the control system of Higgins et al could be implemented using a computer that is controlled by a program. This provides the advantage of decreasing system computation time, as taught by Kliman.

- With respect to claim 9, Higgins et al disclose performing a spectral analysis on the motor power signal (col. 5, lines 48-62).
- With respect to claim 10, Higgins et al do not explicitly disclose applying a FFT to transform the power signal from time domain to frequency domain. However, the Examiner takes Official Notice that it would have been obvious to one having ordinary skill in the art at the time of the invention that a FFT could be used to transform the power signal of Higgins et al from the time domain to the frequency domain. The motivation to apply a FFT to transform the power signal is to provide the advantage of reducing the number of computations, which decreases computation time, when compared to regular Fourier transformation algorithms.
- With respect to claim 11, the system of Higgins et al controls the computer/processor to input the instantaneous motor power signal to a band-pass filter (col. 5, lines 62-68; Fig. 5, #'s 72 and 74).
- With respect to claim 12, Higgins et al disclose the instantaneous motor power signal includes a three-phase power signal (col. 3, lines 49-51).
- With respect to claim 13, the system of Higgins et al displays the spectrum analysis of the power signal on a console (Fig. 1, output to #42).

4. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Higgins et al as applied to claim 14 above, and further in view of Wilder (5,234,319).
   - Higgins et al disclose the power supplied to the motor being supplied from a three-phase supply; however, Higgins et al do not disclose acquiring the voltage and current measurements from at least two phases of the motor.

- Wilder discloses a motor-driven pump that has sensors to measure current and voltage in all three phases of the motor (Fig. 2, #'s 85, 87, 89 measure current and voltage). The motivation to measure current and voltage using all three phases is to provide the advantage of more reliable current and voltage measurements compared to a measurement of current and voltage using only a single phase.
- Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention to modify the device of Higgins et al so that current and voltage sensors measure the current and voltage, respectively, of each phase to the motor (includes at least two phases), thereby providing the advantage of ensuring a more reliable current and voltage measurement, as taught by Wilder.

Allowable Subject Matter

5. Claims 3 and 17 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.
   - With respect to claim 3, Nystrom (5,930,092) discloses automatically disabling a pump if a power signal that is indicative of undesirable torque conditions is outside a predetermined range. However, neither Nystrom nor other Prior Art references disclose automatically disabling a motor system when an undesirable torque condition exceeds a threshold, and wherein the undesirable torque condition is determined based on frequency domain analysis of the power delivered to the motor.
   - With respect to claim 17, the Prior Art discloses distinguishing between transient occurring in a power signal using a timer, where if the signal persists after the timer times

out, the system determines that the signal is undesirable and cuts-off power to the motor. However, the Prior Art does not disclose distinguishing transients based on several cycles of undesirable harmonics in the real-time power signal.

Prior Art

6. The Prior Art of record but not relied upon:

- Mossman et al (6,267,559) discloses a power reduction system for a pump where descreased torque means a descrease in pump noise and vibrations.
- Sugimoto et al (JP 11-311591-A) discloses a diagnostic apparatus for a machine with an electric motor as a driving source, where the diagnostic apparatus transforms a power signal from the time domain to the frequency domain using a Fast Fourier Transform (FFT).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Patrick Miller whose telephone number is 571-272-2070. The examiner can normally be reached on M-F, 8:30-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Martin can be reached on 571-272-2800 ext 41. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9318.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-306-3431.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Patrick Miller
Examiner
Art Unit 2837

pm
August 16, 2004

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